Homework 1: OpenStack IaaS Deployment

ECE 530 Introduction to Cloud Computing

Instructors:

Ioannis Papapanagiotou (ipapapa@unm.edu)

Introduction

The purpose of this lab/homework exercise is to learn how to deploy some of the basic services using the OpenStack project. OpenStack is an open source cloud computing software designed for automation. The basic set of services is depicted in the following figure:
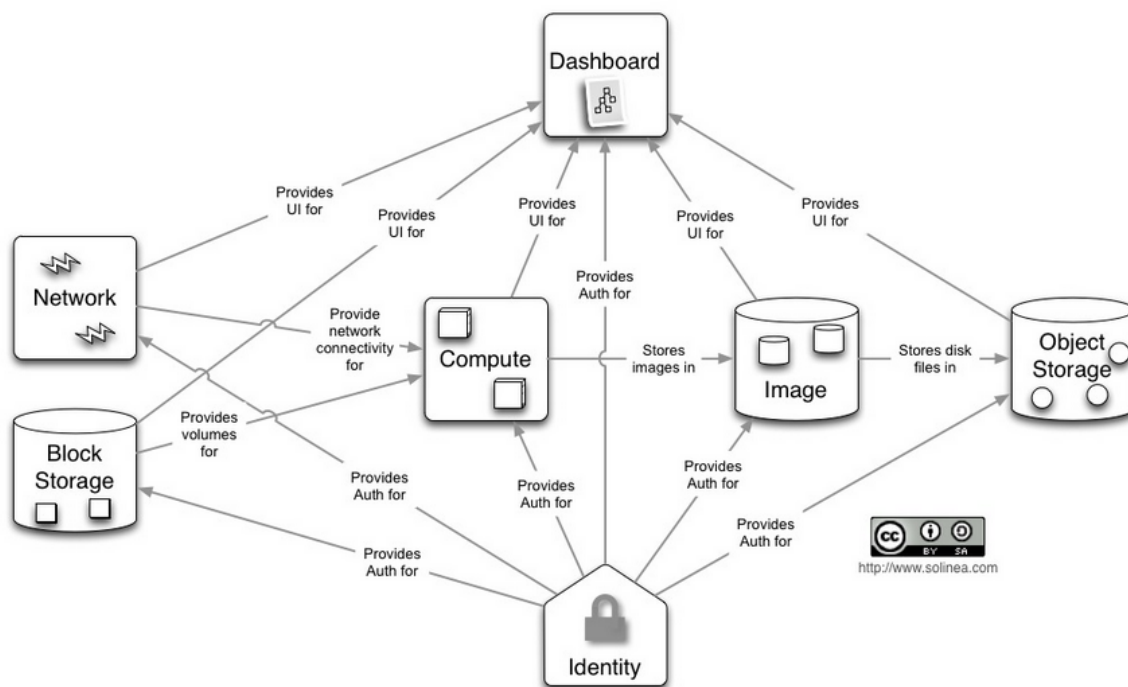
In this work, we are going to focus in the following services:

- **Keystone**: Keystone is the identity service used by OpenStack for authentication (authN) and high-level authorization (authZ).
- **Nova:** Compute (Nova) is a cloud computing fabric controller, which is the main part of an IaaS system. It is designed to manage and automate pools of

computer resources and can work with widely available virtualization technologies, as well as bare metal and high-performance computing (HPC) configurations. KVM and Xen are available choices for hypervisor technology, together with Hyper-V and Linux container technology such as LXC.

- **Horizon**: Dashboard provides administrators and users a graphical interface to access, provision, and automate cloud-based resources. The design accommodates third party products and services, such as billing, monitoring, and additional management tools. The dashboard is also brandable for service providers and other commercial vendors who want to make use of it. The dashboard is one of several ways users can interact with OpenStack resources. Developers can automate access or build tools to manage resources using the native OpenStack API or the EC2 compatibility API.
- **Cinder**: Block Storage provides persistent block-level storage devices for use with OpenStack compute instances. The block storage system manages the creation, attaching and detaching of the block devices to servers. Block storage volumes are fully integrated into OpenStack Compute and the Dashboard allowing for cloud users to manage their own storage needs.

In this lab, your task is to deploy OpenStack on a number of VMs on your system and install some core services. Please start as early as possible. This instruction does NOT guarantee your deployment will be successful.

Installation

1. Install a VM hypervisor in your system
2. Create multiple VMs as the hardware environment for your lab
3. Install Ubuntu Server 18.04 (or better version) on all VMs.
4. You may follow the instructions on
   https://docs.openstack.org/train/install/ to install OpenStack on your VMs. The required services are: *Keystone, Glance, Nova, Networking, Horizon, Cinder*. The network service should be *nova-network*.
5. Provision a subnet, a VM and a storage volume (See Grading List for more

details).

Your system needs to have the following characteristics. The deployment can work with fewer resources but these are some exemplar ones. If you have more resources available the better it is.

Component	Max Value
CPU	6 cores
RAM	6 GB
Storage	200 GB

Deliverables

You may team up with 1-3 people. Each group should email the instructor about their formulated group. Each group will submit one report only by a selected team member. The report should contain every deployment detail including the detailed commands and results (screenshots are always helpful). You should also record the steps you undertook to complete the installation.

Note:
- Automated deployment software (e.g. Devstack) is not allowed. These tools will auto-deploy everything and therefore you are not going to learn anything.
- Make sure you take a screenshot for every step you take. Do not wait until you finish because you may miss the deadline or a latter misconfiguration may not allow you to go back.
- The report should include your names, IDs, and emails of the group members in the first page. A small abstract and a conclusion section will be useful. All reports must be uploaded on UNM Learn in a PDF format.
- If you use data or external resource, make sure you add a `references` section

and add the proper links.

Function	Point
Keystone: 1. Generate token 2. Create *demo* and *admin* user 3. Retrieve user list 4. Retrieve role list	15
Glance: 1. Import Cirros OS image 2. Retrieve image list	10
Nova: 1. Retrieve VM list 2. Create a VM 3. Login in VM	20
Nova-network: 1. Create a Network	15
Horizon: 1. Login with proper account 2. Retrieve service information	10
Cinder: 1. Create a volume 2. Retrieve volume list	15
Swift: 1. Create a container 2. Upload and download file	15
Extra Point: 1. Create a VM with public network connected	1. 20 2. 5

2. Import and create VM with Ubuntu image (inside OpenStack) 3. Attach volume to a VM 4. Install one extra service (Ceilometer, Heat etc.)	3. 5 4. 10

References

https://wiki.openstack.org/wiki/OpenStack